

CLAIMS

We claim:

1. A secured device comprising:
 - 5 a security element, said security element having an ON state and an OFF state, the resistance of said ON state being lower than the resistance of said OFF state; and
 - a phase-change element, said phase-change element comprising a phase-change material, said phase-change material being reversibly transformable between two or more structural states;
 - wherein said security element and said phase-change device are connected in parallel.
- 10 2. The device of claim 1, wherein said security element is a transistor.
3. The device of claim 1, wherein said security element is a multi-terminal phase-change device, said multi-terminal phase-change device including a first terminal, a second terminal and a third terminal, said second and third terminals forming said parallel connection with said phase-change element, said multi-terminal phase-change device comprising a phase-change material,
- 15 said phase-change material being reversibly transformable between two or more structural states.
4. The device of claim 3, wherein said first terminal modulates the current passing between said second terminal and said third terminal.
5. The device of claim 4, wherein said first terminal modulates said current through injection of charge carriers.
- 20 6. The device of claim 4, wherein said first terminal modulates said current through a field effect.
7. The device of claim 1, wherein said phase-change element is a register.

8. The device of claim 7, wherein said register processes or stores data or information in a non-binary fashion.
9. The device of claim 7, wherein said register encrypts data or information.
10. The device of claim 1, wherein said phase-change element is a weighting device, said
5 weighting device having two or more resistance states, said weighting device resistively modifying transmission of an electrical signal passing therethrough.
11. The device of claim 1, wherein said phase-change material comprises S, Se, or Te.
12. The device of claim 11, wherein said phase-change material further comprises Ge or Sb.
13. The device of claim 11, wherein said phase-change material further comprises As or Si.
- 10 14. The device of claim 11, wherein said phase-change material further comprises an element selected from the group consisting of Al, In, Bi, Pb, Sn, P, and O.
15. The device of claim 1, wherein said structural states include amorphous, crystalline or partially-crystalline states.
16. The device of claim 1, wherein said structural states differ in fractional crystallinity.
- 15 17. The device of claim 1, wherein said structural states of said phase-change material include one or more accumulation states.
18. The device of claim 1, wherein said structural states of said phase-change material include two or more accumulation states.
19. The device of claim 1, wherein said structural states of said phase-change material include
20 three or more accumulation states.
20. The device of claim 1, wherein said structural states of said phase-change material include a grayscale state.

21. The device of claim 1, wherein the resistance of said device is approximately equal to the resistance of said phase-change element.

22. The device of claim 1, wherein the resistance of said device is approximately equal to the resistance of said security element.

5 23. The device of claim 1, wherein said structural states include a reset state and a set state.

24. The device of claim 23, wherein the resistance of said OFF state is greater than the resistance of said reset state.

25. The device of claim 23, wherein the resistance of said OFF state is greater than the resistance of said set state.

10 26. The device of claim 23, wherein the resistance of said ON state is less than the resistance of said reset state.

27. The device of claim 26, wherein the resistance of said ON state is greater than the resistance of said set state.

15 28. The device of claim 23, wherein the resistance of said ON state is less than the resistance of said set state.

29. A method of protecting information or data comprising the steps of

providing the secured device of claim 1,

storing said information or data in said phase-change element of said secured device, and

transforming said security element to said ON state.

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